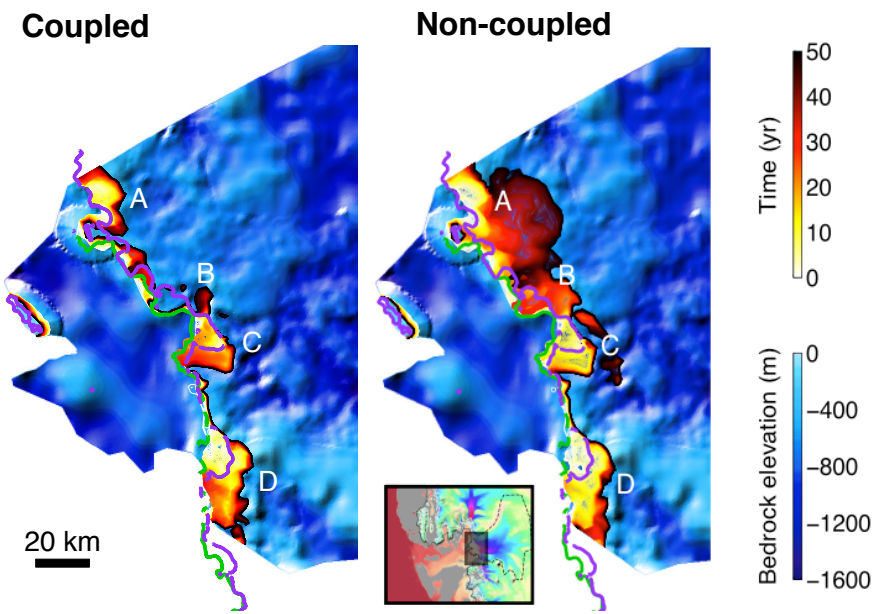
National Aeronautics and Space Administration
Jet Propulsion Laboratory
California Institute of Technology

ICE-OCEAN MODELING OF THWAITES GLACIER

Helene Seroussi



Evolution of the grounding line of Thwaites line over the next 50 years for coupled ice-ocean model (ISSM-MITgcm, left) and standalone ice sheet model with parameterized melting (right). Background shows the bed topography. Green and purple lines represent, respectively, the 1996 and 2011 observed grounding line positions.

Reference: Seroussi, H., Y. Nakayama, E. Larour, D. Menemenlis, M. Morlighem, E. Rignot, and A. Khazendar (2017), Continued retreat of Thwaites Glacier, West Antarctica, controlled by bed topography and ocean circulation, Geophys. Res. Lett., 44, doi:10.1002/2017GL072910.

This work was supported by awards from NASA ROSES Cryospheric Science, Interdisciplinary Research in Earth Science, and Modeling, Analysis and Prediction Programs, from Jet Propulsion Laboratory Research Technology and Development Program, and from the National Science Foundation Program.

Science Question:

Glaciers in the Amundsen Sea Sector are rapidly changing. What is the role of the ocean and how is it going to affect the future of Thwaites Glacier?

Results & Data:

- Thwaites Glacier will continue to lose mass at a similar rate over the next decades.
- Grounding line retreat governed by bed topography but retreat rate depends on oceanic conditions
- Coupled ice-ocean models produce more realistic estimates of glacier retreat rates than ice models driven by parameterized melt.

Data from **Operation IceBridge** (bedrock, bathymetry), **MEaSUREs** (velocities and grounding lines) and **ECCO2** estimates used to initialize, run and validate the models.

Significance:

Results highlight the importance of coupling ice and ocean models and improve projections of ice sheet contribution to sea level rise.